

In the claims

1. (Currently amended) An apparatus for the hydrolysis of protein-containing raw material, the apparatus comprising:

a hydrolysis area that provides hydrolysis of said raw material by reacting a reaction mixture comprising said raw material and at least one enzyme present in said area, wherein the reaction mixture contains both solids and liquid, and wherein upon hydrolysis, said reaction mixture further comprises hydrolysis product;

an inactivation area that receives reaction mixture from the hydrolysis area and substantially inactivates said at least one enzyme present in the reaction mixture; and

a separation area separately located from the inactivation area that receives at least a portion of the reaction mixture from the inactivation area and is capable of separating it into two or more components, including at least one substantially liquid component which comprises water-soluble protein and including at least one substantially solid containing component;

wherein the hydrolysis area, inactivation area, and separation area operate in a continuous non-batch mode without interruption; and

wherein any emulsion present in said liquid component is present in an amount at or below a predetermined level.

2-3. (Canceled)

4. (Previously Presented) The apparatus of claim 1, wherein the level of emulsion present is at or below about 5%.

5. (Previously Presented) The apparatus of claim 1, wherein the level of emulsion present is at or below about 2%.

6. (Previously Presented) The apparatus of claim 1, wherein the level of emulsion present is at or below about 1%.

7. (Previously Presented) The apparatus of claim 1, wherein the level of emulsion present is at or below about 0.5%.

8. (Previously Presented) The apparatus of claim 1, wherein the separation area comprises a slanted filter screen.

9. (Previously Presented) The apparatus of claim 1, further comprising a centrifuge that receives at least a portion of the liquid component, and which separates the portion into at least a first fraction comprising water-soluble protein and at least a second fraction comprising water-insoluble protein.

10. (Previously Presented) The apparatus of claim 1, further comprising at least one pump capable of pumping oil present in the reaction mixture away from the reaction mixture, or comprises a decanter for decanting oil present in the reaction mixture, or comprises both.

11-12. (Canceled)

13. (Previously Presented) The apparatus of claim 1, wherein the hydrolysis area comprises at least one feeder screw for conveying the reaction mixture through the hydrolysis area.

14. (Previously Presented) The apparatus of claim 1, wherein the hydrolysis area comprises a tube-shaped reactor.

15. (Previously Presented) The apparatus of claim 1, wherein the inactivation area comprises at least one feeder screw for conveying the reaction mixture through the inactivation area.

16. (Previously Presented) The apparatus of claim 13, wherein at least one feeder screw rotates clockwise for a first period of time, and counter-clockwise for a second period of time.

17. (Cancelled)

18. (Previously Presented) The apparatus of claim 1, wherein the inactivation reactor comprises an outlet for discharging at least a portion of the reaction mixture and an agitator adjacent to the outlet that suspends solid matter in the reaction mixture near the outlet.

19. (Previously Presented) The apparatus of claim 18, wherein the agitator comprises a screw that rotates in a forward and a reverse direction.

20. (Previously Presented) The apparatus of claim 1, wherein a pump pumps the reaction mixture out of the inactivation area and toward the separation area, such that emulsification of liquid in the reaction mixture is maintained at or below a predetermined level.

21. (Previously Presented) The apparatus of claim 1, further comprising a collection area wherein pieces of protein-containing raw material are collected, and wherein said pieces of protein-containing raw material are provided to the hydrolysis area from said collection area.

22. (Original) The apparatus of claim 21, wherein the collection area includes processing equipment that reduces the size of the pieces of raw material collected.

23. (Previously Presented) The apparatus of claim 1, wherein the apparatus is capable of hydrolyzing the raw material at a rate of two tons per hour.

24. (Previously Presented) The apparatus of claim 1, wherein the apparatus is capable of continuous hydrolysis for at least seventy-two hours.

25. (Canceled)

26. (Previously Presented) The apparatus of claim 1, wherein the apparatus is capable of producing a yield of water-soluble protein from the liquid in the reaction mixture of at least about 50 percent by weight of the weight of protein contained in the raw material.

27. (Previously Presented) The apparatus of claim 1, wherein the apparatus is capable of producing a yield of water-soluble protein from the liquid in the reaction mixture of at least about 60 percent by weight of the weight of protein contained in the raw material.

28. (Previously Presented) The apparatus of claim 1, wherein the apparatus is capable of producing a yield of water-soluble protein from the liquid in the reaction mixture of at least about 70 percent by weight of the weight of protein contained in the raw material.

29. (Previously Presented) The apparatus of claim 1, wherein the apparatus is capable of producing a yield of water-soluble protein from the liquid in the reaction mixture of about 70 percent by weight of the weight of protein contained in the raw material.

30. (Withdrawn) A method for the hydrolysis of protein-containing raw material comprising using the apparatus of claim 1 to hydrolyze said raw material.

31. (Withdrawn) A method for the hydrolysis of protein-containing raw material, the method comprising:

hydrolyzing, in a hydrolysis area, a reaction mixture comprising the raw material and at least one enzyme capable of hydrolyzing the protein in said raw material, wherein the reaction mixture contains both solids and liquid, and wherein upon hydrolysis the reaction mixture further comprises hydrolysis product;

inactivating, in an inactivation area, said at least one enzyme contained in the reaction mixture; and separating in a separation area separately located from the inactivation area at least a portion of the reaction mixture into two or more components, including at least one substantially liquid component which comprises water soluble protein and including at least one substantially solid containing component

wherein the hydrolysis area, inactivation area, and separation area operate in a continuous non-batch mode; and

wherein any emulsion present in said liquid component is present in an amount at or below a predetermined level.

32-33. (Canceled)

34. (Withdrawn) The method of claim 31, wherein the level of emulsion present is maintained at or below about 5%.

35. (Withdrawn) The method of claim 31, wherein the level of emulsion present is maintained at or below about 2%.

36. (Withdrawn) The method of claim 31, wherein the level of emulsion present is maintained at or below about 1%.

37. (Withdrawn) The method of claim 31, wherein the level of emulsion present is maintained at or below about 0.5%.

38. (Withdrawn) The method of claim 31, wherein the step of separating comprises separating the at least a portion of the reaction mixture using a slanted filter screen to yield at least one substantially liquid component and a substantially solid component.

39. (Withdrawn) The method of claim 31, wherein the slanted filter screen has a mesh size of between about 1 and about 200 mesh.

40. (Withdrawn) The method of claim 31, wherein the separating step further comprises separating the at least one substantially liquid component into at least a first fraction comprising a water-soluble protein and at least a second fraction comprising a water-insoluble protein.

41. (Withdrawn) The method of claim 40, wherein the step of separating the at least one substantially liquid component comprises centrifugation.

42. (Withdrawn) The method of claim 31, wherein the reaction mixture is separated into a first component comprising primarily an aqueous solution, a second component comprising primarily lipids, and a third component comprising primarily solid matter.

43. (Withdrawn) The method of claim 31, wherein the step of separating comprises pumping the reaction mixture out of the inactivation reactor.

44. (Withdrawn) The method of claim 31, wherein the step of hydrolyzing comprises conveying the reaction mixture through the hydrolysis area with at least one feeder screw.

45. (Withdrawn) The method of claim 31, wherein the step of hydrolyzing comprises hydrolyzing the reaction mixture in a tube-shaped reactor.

46. (Withdrawn) The method of claim 31, wherein the step of inactivating comprises conveying the reaction mixture through the inactivation area with at least one feeder screw.

47. (Withdrawn) The method of claim 43, wherein at least one of the feeder screws rotates clockwise and counter-clockwise at different times during the inactivation step.

48. (Withdrawn) The method of claim 31, further comprising the step of pumping oil present in the reaction mixture away from the reaction mixture, or the step of decanting oil present in the reaction mixture, or both.

49. (Withdrawn) The method of claim 48, wherein oil is pumped away from the hydrolysis area, the inactivation area, or both.

50. (Withdrawn) The method of claim 31, wherein prior to the step of separating, the reaction mixture in the inactivation area is agitated to substantially suspend solid matter present in the inactivation area.

51. (Withdrawn) The method of claim 31, wherein prior to the step of hydrolyzing, the protein-containing raw material is collected in pieces in a collection area.

52. (Withdrawn) The method of claim 51, wherein, prior to hydrolysis, the collected pieces of raw material are processed to reduce the size of the pieces.

53. (Withdrawn) The method of claim 52, wherein the size of the pieces is from about 15 mm to about 50 mm.

54. (Withdrawn) The method of claim 52, wherein the size of the pieces is 300 mm or more.

55. (Withdrawn) The method of claim 31, wherein the raw material comprises material derived from the group consisting of fish, animal and plant material.

56. (Withdrawn) the method of claim 55, wherein the raw material comprises material derived from fish.

57. (Withdrawn) The method of claim 31, wherein the raw material is hydrolyzed at a rate of two tons per hour.

58-59. (Withdrawn)

60. (Withdrawn) The method of claim 31, wherein the continuous non-batch process is capable of continuous hydrolysis for at least seventy-two hours.

61. (Withdrawn) The method of claim 31, wherein the liquid in the reaction mixture is substantially separated from the solids and water soluble protein is obtained from the liquid.

62. (Withdrawn) The method of claim 61, wherein the yield of water soluble protein obtained from the method is at least about 50 percent by weight of the weight of protein contained in the raw material.

63. (Withdrawn) The method of claim 61, wherein the yield of water soluble protein obtained from the method is at least about 60 percent by weight of the weight of protein contained in the raw material.

64. (Withdrawn) The method of claim 61, wherein the yield of water soluble protein obtained from the method is at least about 70 percent by weight of the weight of protein contained in the raw material.

65. (Withdrawn) The method of claim 61, wherein the yield of water soluble protein obtained from the method is about 70 percent by weight of the weight of protein contained in the raw material.



66-73. (Withdrawn)

74. (Currently amended) An apparatus for the hydrolysis of protein-containing raw material, said raw material also containing solid matter, the apparatus comprising:

means for hydrolyzing said raw material by reacting a reaction mixture comprising said raw material and at least one enzyme present in said area, wherein the reaction mixture contains both solids and liquid, and wherein upon hydrolysis, said reaction mixture further comprises hydrolysis product;

means for substantially inactivating said at least one enzyme present in the reaction mixture; and means for separating, separately located from the inactivation area, at least a portion of the reaction mixture into two or more components, including at least one substantially liquid component which comprises water-soluble protein and including at least one substantially solid containing component;

wherein the hydrolysis area, inactivation area, and separation area operate in a continuous non-batch mode without interruption; and

wherein said apparatus maintains any emulsion present in the liquid in the reaction mixture below a predetermined level.

75-93. (Canceled)